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10/583,809

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Sebastien Perrier

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WIGGIN AND DANA LLP

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HUHN, RICHARD A

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/583,809

**Applicant(s)**

PERRIER, SEBASTIEN

**Examiner**

RICHARD A. HUHNS

**Art Unit**

4131

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 February 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SF/ICE)  
Paper No(s)/Mail Date 22 June 2006, 27 Oct 2006, 14 June 2007
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_



## DETAILED ACTION

### *Specification*

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Dithioester Chain Transfer Agents for Reversible Addition Fragmentation Transfer Polymerization and Method for their Removal.

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

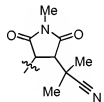
A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-5, 8, 13, 14, 27, and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent No. 6,919,409.
3. As to claim 1: US '409 discloses a method of making a functionalized polymer which includes the steps of reacting (see column 22, examples)
  - a. a dithiocarbonyl compound (structure "CTA", column 22) which corresponds to instant Formula (3) where  $m=1$ ,  $R'$ =a substituted alkyl group, and  $z$ =a heterocycle;

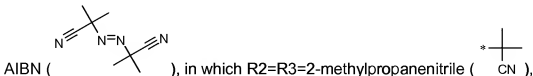
- b. an olefinically unsaturated monomer ("EADA", column 22, line 15);
- c. a first source of free radicals ("MAIB", column 22, lines 36-37)

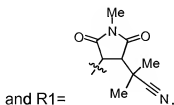
to form a polymer of instant Formula (6); and subsequently contacting the polymer (see column 23, lines 9-59) with a second source of free radicals (AIBN and N-



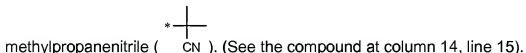
methylmaleimide) to form a polymer of Formula (1) in which R1=

- 4. As to claim 2: US '409 (as applied to claim 1) discloses the olefinically unsaturated monomer EADA, which corresponds to instant Formula (5) with X=hydrogen and Y=CO<sub>2</sub>R" with R"=C<sub>12</sub>-alkyl (ethyladamantyl).
- 5. As to claim 3: US '409 does not describe the recovery of the dithiocarbonyl compound per se. However, the reference describes the removal of the compound from the polymer (see column 23, lines 9-59). The diluted post-reaction mixture described therein seems to contain the dithiocarbonyl compound recovered from the polymer.
- 6. As to claims 4 and 14 : US '409 (as applied to claim 1) discloses a second source of free radicals (AIBN, azobis(isobutyronitrile)) which includes an N=N double bond.
- 7. As to claims 5 and 28: US '409 (as applied to claims) 4 and 14 discloses

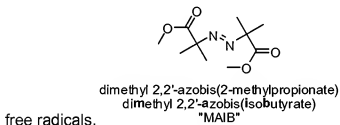




8. As to claim 8: US '409 discloses a dithiocarbonyl compound in which R'=2-



9. As to claim 13: column 22, line 36 discloses the azo initiator MAIB (shown; listed as "dimethyl 2,2'-azobis(2-methylpropionate in the instant claim) as the first source of



free radicals.

10. As to claim 27: The method of US '409 will lead to a polymer obtainable by the method according to instant claim 1.

11. Claim 24 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent Application Publication No. 2003/0088028.

12. US '028 discloses solid supported dithiocarbonyl compounds of Formula (3). (See the structure below paragraph 32, and paragraphs 32-39. For example, the structure includes the embodiment in which the group P includes the solid support R<sub>3</sub> (details in paragraph 39), the group X is sulfur, and the group attached to X is alkyl).

The solid support group  $R_3$  may be a substituted aryl (linker groups Z as in claim 26) connected to a polymer.

***Claim Rejections - 35 USC § 103***

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 6, 7, 20-22, 25, 29, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,919,409 in view of US Patent Application Publication No. 2003/0088028.

15. US '409 discloses the method of claim 1 as applied above to prepare polymers of the instant formula (6) (see US '409 column 14, formula (II)). US '409 fails to disclose the use of solid-supported dithiocarbonyl compounds.

16. US '028 teaches that solid-supported dithiocarbonyl compounds can be used for RAFT polymerization (see the abstract, for example). It would be obvious to a person of ordinary skill in the art to use solid-supported dithiocarbonyl compounds for the RAFT polymerization method of claim 1 as described in US '409, because US '208 teaches that solid-supported dithiocarbonyl compounds may be used for RAFT polymerizations.

17. Further as to claims 6, 7, and 29: A specific embodiment of the solid support in US '208 is dithiocarbonyl compound in which the group Z = benzyl (see paragraphs 169-171, examples 13-14, using phenylethyl phenyldithioacetate).

18. Further as to claims 25 and 30: The use of solid-supported dithiocarbonyl compounds for the RAFT polymerization method of US '409 leads to polymers of formula (6) in which group Z is the solid support.

19. Further as to claims 20-22: It has not been demonstrated that the combination of a solid-supported dithiocarbonyl compound with an unsupported dithiocarbonyl compound for the RAFT polymerization method shows unexpected results. The working examples (instant paragraphs 196-217) show the expected decline in number-averaged molecular weight due to added chain transfer agents.

20. The instant claims 20-22 recite a combination of equivalents known for the same purpose: "It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose." (MPEP 2144.06)

21. Claims 9-12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,919,409.

22. US '409 as applied above fails to disclose an anticipatory example or specifically name the claimed methods. However, the reference discloses that many olefinically unsaturated monomers and solvents may be used for the polymerization method. (See



column 6, line 56 to column 7, line 3 for a list of suitable solvents; and see column 8, line 65 to column 9, line 56 for a list of suitable monomers).

- a. As to claim 9: Column 9, line 13 discloses methyl methacrylate as a suitable monomer.
  - b. As to claim 10: Column 9, lines 7-8 disclose vinyl acetate as a suitable monomer.
  - c. As to claims 11 and 12: Column 9, line 5 discloses *N*-alkylacrylamide (equivalent to "alkylacrylamides" in instant claims 11 and 12) as a suitable monomer.
  - d. As to claim 15: Column 6, line 60 discloses acetone as a suitable solvent.
23. Therefore, it would have been obvious to one of ordinary skill in the art to have used any of the monomers or solvents described by the reference for the method described by the reference, including the claimed method..

24. Claims 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,919,409.

25. US '409 as applied above fails to disclose an anticipatory example or specifically name the claimed methods. However, the reference discloses that the polymerization may be carried out within the temperature range of 20-110 °C (see column 7, lines 10-14). Therefore, it would have been obvious to one of ordinary skill in the art to have used the temperature conditions described by the reference for the method described in the reference, including the claimed method.

26. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,919,409.


27. US '409 as applied above fails to disclose an anticipatory example or specifically name the claimed methods. However, the reference discloses that the polymerization method described therein may be used to prepare block copolymers as recited in the instant claim (see, for example, column 14, line 58 to column 15, line 12). Therefore, it would have been obvious to one of ordinary skill in the art to use the method described in US '409 to prepare block copolymers, including the claimed method.

***Claim Rejections - 35 USC § 112***


26. The following is a quotation of the second paragraph of 35 U.S.C. 112:


The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

27. Claims 7 and 29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

28. Claim 7 recites the limitations for the group Z of: , other nitrogen-containing groups, and other aromatic groups, in a list of chemical structures starting on the third line of the claim. There is insufficient antecedent basis for this limitation in the claim. The generic limitations of the group Z in claim 6, on which claim 7 is dependent,

do not encompass the specific limitations recited in the instant claim. For example, the

imidazole group (  ) does not belong to any of the generic group limitations recited in claim 6.

29. Claim 29 recites the limitation for the group R of:  and others. There is insufficient antecedent basis for this limitation in the claim. Claims 6 and 1 do not refer to the group "R".

### ***Conclusion***

30. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. 6,395,850 discloses multi-functional dithiocarbonyl compounds for RAFT polymerization.
- b. US Patents Nos. 7,012,119 and 7,109,276 disclose methods of removing dithiocarbonyl compounds from RAFT polymers.
- c. US Patent No. 7,250,479 discloses similar methods.
- d. US Patent Application Publication No. 2004/0225090 describes both solid-supported and unsupported dithiocarbonyl compounds for RAFT.

- e. Chiefari et al. Living Free-Radical Polymerization by Reversible Addition-Fragmentation Chain Transfer: The RAFT Process. *Macromolecules* 1998, 31, 5559-5562 is a seminal paper on RAFT polymerization.
- f. Perrier, Sebastien. "Polymers with Well-Defined End Groups via RAFT – Synthesis, Applications and Postmodifications." Handbook of RAFT Polymerization. Barner-Kowollik, Christopher (ed.). Darmstadt. Wiley-VCH, 21 Mar 2008. pp 455-482.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RICHARD A. HUHN whose telephone number is (571) 270-7345. The examiner can normally be reached on Monday to Friday, 7:30 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Sample can be reached on (571) 272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Art Unit 4131

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